

REMARKS

These remarks are in response to the Office Action mailed on March 3, 2004. Applicants thank the Examiner for indicating the allowability of claims 5, 8, 10-28, 33, 36, 44-50, 52, 58, and 63-70. The Office Action rejected claims 1-4, 6, 7, and 9 under 35 U.S.C. 102(a) as being anticipated by Lee *et al.* (U.S. patent number 6,275,417) and rejected claims 29-32, 34, 35, 37-43, 51, 53-57, and 59-62 under 35 U.S.C. 102(b) as being anticipated by Dunlap *et al.* (U.S. patent number 5,748,533). Claims 29 and 53 have been amended to make their meanings more explicit. For the reasons stated below, it is respectfully submitted that Office Action's rejection of claims 1-4, 6, 7, 9, 29-32, 34, 35, 37-43, 51, 53-57, and 59-62 is not well founded and should be withdrawn. Applicants thank the Examiner for indicating the allowability of claims 5, 8, 10-28, 33, 36, 44-50, 52, 58, and 63-70.

Rejections under 35 U.S.C. 102(a) based on Lee et al.

The Office Action rejected claims 1-4, 6, 7, and 9 under 35 U.S.C. 102(a) as being anticipated by Lee *et al.* (U.S. patent number 6,275,417). These rejections are respectfully submitted to be in error. The Office Action is correct in that Lee describes techniques for reading a memory cell where the voltage applied to the control gate changes in jump steps; however, these techniques differ in a number of ways from the aspects of the present invention embodied in claim 1.

As described beginning at column 4, line 37, in the process of Lee, a memory cell selected for a read process has a set of voltages, including a first control gate voltage, applied to it and the cell's current is read out. The control gate voltage is then increased to a second level (or "jump-step") and the current read again, and so on. For two levels or jump steps, this is shown in Figure 4, with the three step level case in Figure 5. Consequently, what Lee teaches is a series of conventional read intervals, where the sense voltages applied to a memory cell are held constant and the cell current measured, with the control gate voltage jumped to the next step in the series between these intervals. This is something quite different to what is claimed in claim 1 of the present application.

Concerning noise, what the Abstract states is that "DRAM-type sense amplifiers are provided to maintain high noise immunity." This is described in more detail

beginning at column 7, line 6. This does not describe a method of reading a cell where the noise of the measured parameter is decreased by any stimulus *applied to the memory cell*, but rather is another aspect of the teachings of Lee that are directed at a *sense amplifier* with improved noise-immunity. This is again something quite different to what is claimed in claim 1 of the present application.

More specifically, claim 1 reads, where the emphasis is added, as:

A method of reading the data content of a non-volatile memory storage unit, comprising:

applying a set of sense voltage waveforms to the terminals of the memory storage unit during *a read interval*;

measuring a parameter value related to the data content of the memory storage unit during the read interval, wherein the measured value for the parameter includes the contribution of a noise component;

applying an episodic stimulus to the memory storage unit during *the read interval*, wherein the level of stimulus affects the parameter value and *whereby the contribution of the noise component is reduced*.

As described above, Lee does not teach “applying an episodic stimulus ... during the read interval”; rather, Lee only applies a sense voltage waveform consisting of a set of constant voltages during each read interval, where the control gate voltage is raised between different read intervals. Consequently, Lee lacks an “episodic stimulus” applied during the read interval, only utilizing a series of sense waveforms, each during a corresponding read interval. Further, Lee does not teach “applying an episodic stimulus”, or any other stimulus, “to the memory storage unit ... whereby the contribution of the noise component is reduced”; rather, Lee only present a sense amplifier with “higher noise-immunity than prior art sense amplifiers.” (Lee, col. 7, lns. 26-27) Therefore, it is respectfully submitted that the rejection of claim 1 and its dependent claims 2-4, 6, 7, and 9 under 35 U.S.C. 102(a) as being anticipated by Lee *et al.* is not well founded and should be withdrawn.

The Office Action also rejected dependent claims 2-4, 6, 7, and 9. These claims all recite additional features or limitations, which it is believed, make these claims further allowable. However, as the Office Action does not supply any specifics as to why these claims are rejected, they will not be discussed further at this time in order to same space.

Rejections under 35 U.S.C. 102(b) based on Dunlap et al.

The Office Action rejected claims 29-32, 34, 35, 37-43, 51, 53-57, and 59-62 under 35 U.S.C. 102(b) as being anticipated by Dunlap *et al.* (U.S. patent number 5,748,533).

These rejections are also respectfully submitted to be in error for similar reasons as those given above with respect to Lee.

The read process described in Dunlap describes applying a set of sense voltages to a memory cell, where a ramp voltage is used for control gate voltage. Once the memory cell trips (by either turning on or off in a process dependent on the state of the cell), another read process is begun with the control gate voltage ramped in the other direction. After every pair of such read intervals, the ramp rate is reduced in order to improve the accuracy of the read. Eventually, using the coarse to fine read method, the sensed value for the threshold value of the memory cell is taken to converge to data state of the cell. Consequently, Dunlap is only teaching applying a series of sense voltage conditions to a selected memory cell in order to determine its state, the novelty consisting of determining this state a number of different times, each time using one a series of ramped control gate voltages that alternate between rising and falling where the direction is reversed based on the state of the cell and where the ramp rate is decreased as the process goes on in order to improve accuracy.

Concerning independent claims 53 and its dependent claims, claims 54-57 and 59-62, claim 53 specifies states drivers for applying both a sense voltage condition and an episodic stimulus:

A non-volatile memory, comprising:
a memory storage unit;
a sense amplifier connected to the memory storage unit for determining the state of the memory storage unit in response to a set of read voltages; and
drivers connected to the memory storage unit for applying the set of read voltages to the memory storage unit, the set of read voltages comprising:
a sense voltage condition; and
an episodic stimulus voltage condition, wherein the episodic stimulus voltage condition is distinct from the sense voltage condition.

As the added emphasis shows, this claim is drawn to the aspect of the present invention that includes using both a sense voltage condition *and* a distinct episodic stimulus condition. Further, claim 53 is amended in the present application to make more explicit that “the episodic stimulus voltage condition is distinct from the sense voltage condition.” This differs from the Dunlap patent, which teaches the use of only a sense voltage condition.

More specifically, the Office Action refers to the ramped control gate voltage of Dunlap. However, as described above, this is only a series of distinct sense voltage conditions applied to the control gate. Dunlap neither teaches nor suggests “drivers connected to the memory storage unit for applying ... to the memory storage unit ... a sense voltage

condition; and an episodic stimulus voltage condition, wherein the episodic stimulus voltage condition is distinct from the sense voltage condition”, where the emphasis is again added.

Therefore, it is respectfully submitted that the rejection of claim 53 and its dependent claims 54-57 and 59-62 under 35 U.S.C. 102(b) as being anticipated Dunlap is not well founded and should be withdrawn. The dependent claims 54-57 and 59-62 all recite additional features or limitations, which, it is believed, make these claims further allowable. However, as the Office Action does not supply any specifics as to why these claims are rejected, they will not be discussed further at this time in order to same space.

Similarly, the Office Action rejected method claims 29-32, 34, 35, 37-43, and 51 under 35 U.S.C. 102(b) as being anticipated by Dunlap *et al.*. Claim 29 is drawn to aspects of the present invention similar to those of found in claim 53 and is consequently also believed allowable for much the same reasons.

Claim 29 states:

A method of operating of a non-volatile memory, comprising:
applying a set of voltages to a storage unit of the non-volatile memory during
an interval;
determining the conduction characteristics of the storage unit in response to
the set of voltages, *wherein the set of voltages includes a sense voltage condition and
an episodic stimulus component distinct from the sense voltage condition.*

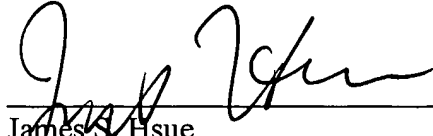
As the added emphasis indicates, claim 29 also includes the limitation that “the set of voltages includes a sense voltage condition *and* an episodic stimulus component distinct from the sense voltage condition”, a feature not found in Dunlap. (As with claim 53, claim 29 has been amended to make it more explicit that the episodic stimulus component is distinct from the sense voltage condition.) Consequently, it is respectfully submitted that the rejection of claim 29 under U.S.C. 102(b) as being anticipated by Dunlap *et al.* is not well founded and should be withdrawn.

The Office Action also rejected dependent claims 30-32, 34, 35, 37-43, and 51. These claims all recite additional features or limitations, which it is believed, make these claims further allowable. However, as the Office Action does not supply any specifics as to why these claims are rejected, they will not be discussed further at this time in order to same space.

Conclusion

For any of these reasons, rejected claims 1-4, 6, 7, 9, 29-32, 34, 35, 37-43, 51, 53-57, and 59-62 are believed allowable. Reconsideration of these claims is therefore respectfully requested and an early indication of their allowability is earnestly solicited.

Respectfully submitted,



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